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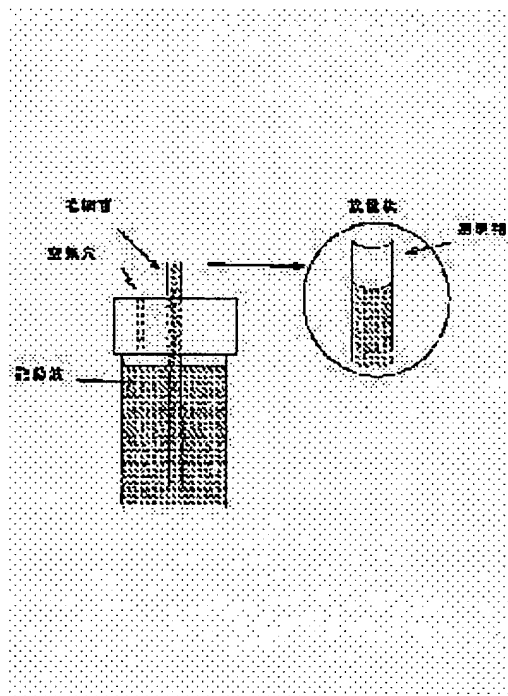
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## (54) RECORDING LIQUID AND METHOD FOR ASSESSING RECORDING LIQUID

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a recording liquid which at least comprises a dispersant, a water-soluble liq. medium, a humectant, a pigment, and water and is excellent in resistance to clogging and delivery recovery in an emergency and an assessment method for selecting the recording liquid.

SOLUTION: The dispersant of this recording liquid is a polyoxyethylene alkyl (or alkylphenyl) ether sulfuric ester salt deriv., and a humectant is selected from among specified compds. The recording liquid forms a meniscus at a nozzle hole surface and, when exposed to the air, causes the phase separation due to the evaporation of water from the liquid. The surface forming a meniscus after the phase separation is a clear phase with a high humectant concn. The method for assessing a recording liquid comprises drying the liquid and assessing the change in ink particle size and redispersibility before and after the drying. Thus, a recording liquid excellent in resistance to clogging and the delivery recovery in an emergency is selected.



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## CLAIMS

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### [Claim(s)]

[Claim 1] The recording ink used for ink jet record at least A dispersant, a water-soluble solvent object, It is watercolor pigment system recording ink which consists of a moisturizer, a pigment, and water, and the dispersant of this recording ink is a polyoxyethylene alkyl (or alkylphenyl) ethereal sulfate ester salt derivative. When this recording ink forms a meniscus and atmospheric-air exposure is carried out on a nozzle hole front face, Recording ink which the surface which produces phase separation because the moisture in recording ink evaporates, and forms the meniscus after this phase separation is a transparence phase with high moisturizer concentration, and is characterized by excelling in the regurgitation recoverability in an emergency at blinding-proof nature and a list.

[Claim 2] The recording ink used for ink jet record at least A dispersant, a water-soluble solvent object, It is watercolor pigment system recording ink which consists of a moisturizer, a pigment, and water. The moisturizer of this recording ink A glycerol, Polyhydric alcohol other than a group to at least one kind of moisturizer component which consists of triethylene glycols and polyethylene glycols (average molecular weight) 200, 300 (average molecular weight), and 400 (average molecular weight), and the above-mentioned group Recording ink according to claim 1 characterized by being the mixed moisturizer system which comes to combine at least one kind of moisturizer component from the group which consists of a saccharide, a pyrrolidone, and a polyvinyl pyrrolidone.

[Claim 3] The evaluation approach of the recording ink characterized by selecting the recording ink which was excellent in the regurgitation recoverability in an emergency at the blinding-proof nature selected by drying recording ink and evaluating redispersible in particle-size change of the ink before and behind desiccation, and a list, and a list.

[Claim 4] Recording ink according to claim 3 characterized by the desiccation ink at the time of evaluating redispersible being ink from which the moisture and the volatile additive in recording ink were removed.

[Claim 5] Claim 3, the evaluation approach of the recording ink four publications which are characterized by the desiccation ink at the time of evaluating redispersible drying recording ink in a natural-posture style method or the desiccator containing a desiccating agent at constant-rate measure picking and a room temperature (20 to 30 degrees C).

[Claim 6] Claims 3 and 4, the evaluation approach of the recording ink five publications which are characterized by being ink from which the moisture and the volatile additive of recording ink were removed until desiccation ink is what dried recording ink and became 0.3% or less of the amount of record liquid weight before weight change 24 hours after drying.

[Claim 7] Claims 3, 4, and 5, the evaluation approach of the recording ink six publications which are characterized by being less than 2 double [ of the particle size of the recording ink before the particle size of desiccation ink drying ].

[Claim 8] Redispersible is the evaluation approach of the recording ink claims 3, 4, 5, and 6 and seven publications characterized by being the property which is not condensed but is developed in recording ink when the thickened desiccation ink contacts recording ink.

[Claim 9] Claims 3, 4, 5, 6, and 7, the evaluation approach of the recording ink eight publications which are characterized by the redispersible evaluation approach evaluating the expansion nature to the pure water of desiccation ink.

[Claim 10] Claims 3, 4, 5, 6, 7, and 8, the evaluation approach of the recording ink nine publications which are characterized by being what the redispersible evaluation approach becomes from the following test methods.

[Claim 11] Claims 3, 4, 5, 6, 7, and 8, the evaluation approach of the recording ink nine publications which are characterized by developing in pure water in the redispersible test method of claim 10, without desiccation ink breaking off.

[Claim 12] Claims 3, 4, 5, 6, 7, and 8, the evaluation approach of the recording ink nine publications which are characterized by the time amount which the tip of the developed desiccation ink moves to (b) from (a) in the

redispersible test method of claim 10 being less than 20 seconds.

[Claim 13] Claim 1 characterized by being less than 2 double [ of the particle size of the recording ink before the particle size of desiccation ink drying ] when a redispersible trial is performed, recording ink of two publications.

[Claim 14] Claim 1 characterized by being the property which is not condensed but is developed in recording ink when the desiccation ink thickened when a redispersible trial was performed contacts recording ink, recording ink of two publications.

[Claim 15] Claim 1 characterized by the time amount which the tip of the developed desiccation ink moves to (b) from (a) being less than 20 seconds when a redispersible trial is performed, recording ink of two publications.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the recording ink used for ink jet record.

[0002] Moreover, this invention relates to the evaluation approach of the recording ink for selecting the recording ink which fulfills the various demand characteristics used for ink jet record.

[0003] Furthermore, this invention relates to the recording ink selected by the evaluation approach of the recording ink for selecting the recording ink which fulfills the various demand characteristics used for ink jet record.

[0004]

[Description of the Prior Art] Ink jet record is the record approach which is the record approach in which high-speed printing is possible, and is spreading quickly in the low noise recently. Such ink jet record makes recording ink breathe out as a small drop by approaches, such as heating or pressurization, and records by making it adhere to recorded materials, such as paper.

[0005] The color was used as a color material of recording ink until now. However, it is more advantageous to use a pigment rather than a color, if it thinks from the field of the deck watertight luminaire and the weatherability of a record object. Moreover, it is more advantageous to use an aqueous solvent object rather than a nonaqueous nature solvent object as a solvent object, if it usually thinks from the field of the blot by in the paper.

[0006] Then, a pigment is used for the color material of recording ink, and development of the watercolor pigment system recording ink which distributed this pigment on the aqueous solvent object is performed.

[0007]

[Problem(s) to be Solved by the Invention] When an emergency, i.e., a head, is put to printing under a low humidity environment, and a list under long duration atmospheric air, or when [ while the discharge part and the feed zone had dissociated with the ink jet head of another form, ] long duration neglect of a discharge part and the recording ink feed zone is carried out, as for the recording ink used for ink jet record, the moisture in recording ink and an volatile additive evaporate from the connection of a nozzle hole, a discharge part, and a recording ink feed zone.

[0008] Although watercolor pigment system recording ink and aqueous color system recording ink produce a viscosity rise of the recording ink accompanying it, it is raised that problems, such as blinding which originates in condensation of a pigment compared with aqueous color system recording ink, tend to produce watercolor pigment system recording ink.

[0009] Evaporation of the moisture from a nozzle hole is produced with a non-used nozzle during printing. In this case, the thickening recording ink of the meniscus surface section of a non-used nozzle, i.e., a certain nozzle by which fixed time amount atmospheric-air neglect was carried out, is removed by recovery action, such as air ejecting. Furthermore, when a nozzle is exposed to atmospheric air for a long period of time, since moisture and an volatile additive evaporate further from recording ink, recovery action which removes thickening recording ink by suction, wiping, etc. is performed.

[0010] It is left by a discharge part and the recording ink feed zone in the condition that the discharge part and the recording ink feed zone \*\*\*\*ed by the printer of another form, and when blinding arises in a connection, a discharge part and a recording ink feed zone are connected again, and recovery action by suction is usually performed.

[0011] When recovery action is performed, it is necessary for the thickening recording ink with which the moisture in recording ink and an volatile additive evaporated to have the viscosity of air ejecting and extent easily removable [ with suction actuation ] in the long run, and a fluidity in the short term. Furthermore, it also becomes a requirement that the above-mentioned thickening recording ink is easily mixed with recording ink. Even after there is no pigment condensation of thickening recording ink as recording ink which fills them and moisture and an volatile additive

evaporate from recording ink, it is called for that redispersible [ to recording ink ] is excellent.

[0012] Then, the purpose of this invention is providing blinding-proof nature and a list with watercolor pigment system recording ink excellent in the regurgitation recoverability in an emergency.

[0013] Moreover, the purpose of this invention is providing blinding-proof nature and a list with the evaluation approach for selecting watercolor pigment system recording ink excellent in the regurgitation recoverability in an emergency. Furthermore, the purpose of this invention is offering the recording ink selected by the evaluation approach of the recording ink for selecting the water-soluble pigment system recording ink which was excellent in the regurgitation recoverability in an emergency at blinding-proof nature and a list.

[0014]

[Means for Solving the Problem] At least the recording ink of this invention A dispersant, a water-soluble solvent object, a moisturizer, a pigment, It is watercolor pigment system recording ink which consists of water, and the dispersant of this recording ink is a polyoxyethylene alkyl (or alkylphenyl) ethereal sulfate ester salt derivative. When this recording ink forms a meniscus and atmospheric-air exposure is carried out on a nozzle hole front face, Phase separation is produced because the moisture in recording ink evaporates, and the surface which forms the meniscus after this phase separation is a transparence phase with high moisturizer concentration, and is characterized by excelling in the regurgitation recoverability in an emergency at blinding-proof nature and a list.

[0015] In addition, we found out that the phase separation phenomenon of the recording ink of this invention was a phenomenon which the nozzle hole of an ink jet printer or a diameter produces by moisture evaporation from a minute path of a less than several mm capillary tube etc.

[0016] The moisturizer of the recording ink of this invention Moreover, a glycerol, triethylene glycol, Polyhydric alcohol other than a group to at least one kind of moisturizer component which consists of polyethylene glycols (average molecular weight) 200, 300 (average molecular weight), and 400 (average molecular weight), and the above-mentioned group It is what is characterized by being the mixed moisturizer system which comes to combine at least one kind of moisturizer component from the group which consists of a saccharide, a pyrrolidone, and a polyvinyl pyrrolidone. For example, as polyhydric alcohol other than the above-mentioned group, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-propanediol, 1,3-butanediol, etc. are raised, and xylitol, a sorbitol, etc. are raised as a saccharide.

[0017] The evaluation approach of the recording ink of this invention is characterized by drying this recording ink for the purpose of selecting the recording ink which was excellent in the regurgitation recoverability in an emergency at blinding-proof nature and a list about the watercolor pigment system recording ink with which the recording ink used for ink jet record consists of a dispersant, an aquosity solvent object, a moisturizer, a pigment, and water at least, and evaluating redispersible in particle-size change of the ink before and behind desiccation, and a list.

[0018] The desiccation ink of the evaluation approach of the recording ink of this invention is characterized by being ink from which the moisture and the volatile additive in recording ink were removed.

[0019] It is characterized by the desiccation ink of the evaluation approach of the recording ink of this invention drying recording ink in a natural-posture style method or the desiccator containing a desiccating agent at constant-rate measure picking and a room temperature (20 to 30 degrees C). When a direct wind hits recording ink front faces, such as desiccation with that evaporation of the recording ink constituent which cannot happen in the state of the usual head neglect in the desiccation under an elevated temperature, and condensation of a pigment may arise, and a forced-convection method, in that case, it cannot use from the homogeneity of the system of desiccation ink being lost.

[0020] It is characterized by being ink from which the moisture and the volatile additive of recording ink were removed until the desiccation ink of the evaluation approach of the recording ink of this invention is what dried recording ink and becomes 0.3% or less of the amount of record liquid weight before weight change 24 hours after drying.

[0021] It is characterized by the particle size of the desiccation ink of the recording ink selected by the evaluation approach of the recording ink of this invention being less than 2 double [ of the particle size of the recording ink before desiccation ]. When recording ink dries and a pigment condenses, the rapid rise of viscosity arises and it becomes return impossible by recovery action, such as suction. Furthermore, there is a trouble which a condensation pigment enters in a head and blocks with passage and a nozzle hole.

[0022] It is characterized by redispersible [ of the evaluation approach of the recording ink of this invention ] being a property which is not condensed but is developed in recording ink, when the thickened desiccation ink contacts recording ink.

[0023] Redispersible evaluation of the evaluation approach of the recording ink of this invention is characterized by evaluating the expansion nature to the pure water of desiccation ink.

[0024] It is characterized by being what redispersible evaluation of the evaluation approach of the recording ink of this

invention becomes from the following test methods.

[0025] It is characterized by developing the recording ink selected by the evaluation approach of the recording ink of this invention in pure water in a redispersible test method, without desiccation ink breaking off. When desiccation ink contacts recording ink, and condensation of a pigment arises by a solvent shock etc., there is a problem which it not only causes passage plugging and nozzle hole plugging, but the suction hole which is one of the recovery devices blocks.

[0026] In a redispersible test method, as for the recording ink selected by the evaluation approach of the recording ink of this invention, time amount which the tip of the developed desiccation ink moves to b from a is characterized by being less than 20 seconds.

[0027] When the recording ink of this invention performs a redispersible trial, it is recording ink characterized by being less than 2 double [ of the particle size of the recording ink before the particle size of desiccation ink drying ].

[0028] The recording ink of this invention is recording ink characterized by being the property which is not condensed but is developed in recording ink, when the desiccation ink thickened when a redispersible trial was performed contacts recording ink.

[0029] When the recording ink of this invention performs a redispersible trial, it is recording ink characterized by the time amount which the tip of the developed desiccation ink moves to b from a being less than 20 seconds.

[0030] Although the dispersant of the recording ink of this invention and a moisturizer are as having been shown above, as water-soluble solvent objects other than these, various ARUKA roll amines, such as diethanolamine and triethanolamine, etc. are used as one of the counter ion kinds of a dispersant. The permeability grant agent to the space of recording ink, pH regulator, a surface tension regulator, a viscosity controlling agent, etc. are added if needed as other water-soluble media.

[0031] In addition, as a counter ion kind of a dispersant, alkaline metals, such as sodium and a potassium, ammonia, etc. can be used other than an ARUKA roll amine.

[0032] The pigment used for recording ink can use the various pigments after investigating compatibility with the color tone demanded and a dispersant etc. The typical thing of black colors can use an azo pigment etc. as a quinacridone pigment and a yellow system pigment as a phthalocyanine pigment and a reddish pigment as carbon black and a blue system pigment.

[0033] (Operation) While the recording ink of this invention solves the blinding problem of a nozzle since the further moisture evaporation is barred by producing phase separation and a meniscus surface being protected with a transparence phase with high moisturizer concentration when atmospheric-air exposure of the nozzle hole is carried out Since it is recording ink selected by the above-mentioned redispersible trial, larger aperture than a nozzle hole for example Also when long duration neglect of the connection of a discharge part and a recording ink feed zone etc. is carried out, the desiccation ink formed of moisture evaporation is soft, and there is no pigment condensation, and it becomes possible to return easily by the usual recovery action from redispersible [ to recording ink ] being further excellent.

[0034]

[Embodiment of the Invention] The mixed dissolution of a dispersant, a water-soluble solvent object, a moisturizer, and the water is carried out, and it considers as a dispersion medium. Mixed distribution of this dispersion medium and pigment is carried out, and recording ink is prepared.

[0035] In that case, when the dispersion medium which carried out the mixed dissolution of some water-soluble solvent objects, some moisturizers, and some water is used, a recording ink undiluted solution is obtained, the water-soluble medium of the remainder after distribution, a moisturizer, and water are added to a recording ink undiluted solution, and it considers as recording ink.

[0036] In addition, a permeability grant agent, pH regulator, a surface tension regulator, a viscosity controlling agent, etc. are added if needed.

[0037] Grinding dispersers, such as a sand mill, a ball mill, an ultrasonic homogenizer, a high-pressure homogenizer, and a jet mill, are used for mixed distribution of this dispersion medium and pigment.

[0038] Next, centrifugal separation and filtration processing refine recording ink except for a non-recording ink component in the big and rough particle in the recording ink prepared by the above-mentioned actuation, and a list.

[0039] The following trials are performed in order to check the existence of phase separation about the obtained recording ink.

[0040] Phase separation verification test; the recording ink of the constant rate in the sample bottle which prepared the capillary tube entry and the vent in the lid is filled, the height of a capillary tube is adjusted, and a meniscus is formed in a capillary tube front face. The capillary tube to be used has a desirable thing with a diameter of 1mm or less. Day

neglect of the produced sample is carried out in the environment under 25 degrees C of atmospheric temperature, and 40 - 60% of humidity. The existence of the phase separation of ink is visually checked after neglect. Although the example of the gestalt of an exam is shown in drawing 1 , if it is within the limits of this invention, it will not be limited to this.

[0041] The example of the gestalt of a redispersible trial is shown in drawing 2 and a list below. If it is within the limits of this invention, it will not be limited to this.

[0042] After preparing and refining the recording ink of various presentations, 0.3000g is measured on a petri dish with a bore of 3cm, respectively.

[0043] It puts in into the desiccator containing the silica gel which activated the measured recording ink, and is left at a room temperature, and desiccation ink is prepared.

[0044] It evaluates by making into the last point the point where the weight 24 hours after desiccation ink became 0.0009g or less.

[0045] Pure water is filled in a container with a bore [ of 2cm ], and a height of 5cm. It sets to a points which showed desiccation ink to the point of the wire made from platinum with an outer diameter of 0.8mm from the base of the little picking above-mentioned container at 25mm drawing 2 .

[0046] The expansion condition to the pure water of desiccation ink and time amount until the tip of desiccation ink moves from a to b at the base of a container at a list are measured in that case.

[0047] On the other hand, it carried in the on-demand mold piezo-electricity system ink jet printer of the form according to cartridge-head in order to evaluate the recoverability in an emergency in blinding-proof nature and a list about each recording ink, and the following trials were performed.

[0048] The head which equipped the printer with the shelf test \*\* head, and connected with the cartridge after checking the normal regurgitation is left in the state of a no cap for 25 degree-C-low humidity (less than 10%) 1 hour. In the meantime, recovery action, such as air ejecting and suction, is not performed. The existence of the regurgitation from a first dot, gap of an impact location, etc. are evaluated after neglect.

[0049] The head which equipped the printer with the shelf test \*\* head, and connected with the cartridge after the normal regurgitation check will be left under ordinary temperature-normal relative humidity in the state of a no cap for 30 days. After neglect, while observing the nozzle section of a head, a printer is equipped again, return actuation by suction-wiping is performed, and a discharge condition is checked.

[0050] The head which equipped the printer with the shelf test \*\* head, and connected with the cartridge after the normal regurgitation check will be left under (20% or less of humidity) 40 degree-C-damp in the state of a no cap for 14 days. After neglect, a printer is again equipped as if the nozzle section of a head is observed, return actuation by suction-wiping is performed, and a discharge condition is checked.

[0051] The head which equipped the printer with the shelf test \*\* head, and connected with the cartridge after checking the normal regurgitation will be left under 40 degree-C-low humidity (less than 5% of humidity) in the state of a no cap for 15 days. Then, a printer is equipped again and return actuation by suction is performed.

[0052] (Example 1) The compounding ratio of recording ink is shown below.

[0053]

Water 63.2 % of the weight Polyoxyethylene lauryl ethereal sulfate sodium (25% of active principles) 6.8 % of the weight Glycerol 7.0 % of the weight Polyethylene glycol 200 (average molecular weight) 8.0 % of the weight Tripropylene glycol 10.0 % of the weight Carbon black 5.0 % of the weight [0054] As a result of performing a phase separation trial after preparation and purification using the obtained recording ink, phase separation was clearly checked on the meniscus front face.

[0055] Next, the result of having prepared desiccation ink using the above-mentioned recording ink, and having performed the redispersible trial is shown.

- particle-size [ of desiccation ink ] : -- 187nm pigment particle-size [ of the recording ink before desiccation ] : -- expansion nature [ to the pure water of 110nm and desiccation ink ] : -- it developed, without breaking off, as shown in drawing 2 .

- Time of concentration from a to b at the tip of desiccation ink : 12.4 seconds [0056] Next, the result of various shelf tests is shown.

- Shelf test \*\* : 1 hour after the no-cap was found by carrying out the normal regurgitation from an initial dot.

- Shelf test \*\*; when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it checked that the liquid more transparent than the transparent liquid adhered at the tip of a wire on a nozzle hole front face existed. Then, when the printer was equipped with the head and return actuation by suction-wiping was performed, ink carried out the normal regurgitation from all nozzles in one return actuation.



- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it checked that the liquid more transparent than the transparent liquid adhered at the tip of a wire on a nozzle hole front face existed. Then, when the printer was equipped with the head and return actuation by suction-wiping was performed, ink carried out the normal regurgitation from all nozzles in one return actuation.

- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it checked that the liquid more transparent than the transparent liquid adhered at the tip of a wire on a nozzle hole front face existed. Then, when the printer was equipped with the head and return actuation by suction-wiping was performed, ink carried out the normal regurgitation from all nozzles in one return actuation.

[0057] (Example 2) The compounding ratio of recording ink is shown below.

[0058]

Water 68.2 % of the weight Polyoxyethylene nonylphenyl ether A sulfuric-acid-diethanolamine salt 1.8 % of the weight Diethylene glycol 2.0 % of the weight 1,3-propanediol 15.0 % of the weight Glycerol 5.0 % of the weight Polyethylene-glycol (mean molecular weight) 200 3.0 % of the weight Carbon black 5.0 % of the weight [0059] As a result of performing a phase separation trial after preparation and purification using the obtained recording ink, phase separation was clearly checked on the meniscus front face.

[0060] Next, the result of having prepared desiccation ink using the above-mentioned recording ink, and having performed the redispersible trial is shown.

- particle-size [ of desiccation ink ]: -- 190nm pigment particle-size [ of the recording ink before desiccation ]: -- expansion nature [ to the pure water of 110nm and desiccation ink ]: -- it was good like the example 1.

- Time of concentration from a to b at the tip of desiccation ink : 9.8 seconds [0061] Next, the result of various shelf tests is shown.

- Shelf test \*\*: 1 hour after the no-cap was found by carrying out the normal regurgitation from an initial dot.

- Shelf test \*\*: like the example 1, after neglect, while checking that a transparent liquid existed in a nozzle hole front face, the normal regurgitation was recovered and carried out in one subsequent return actuation.

- Shelf test \*\*: like the example 1, after neglect, while checking that a transparent liquid existed in a nozzle hole front face, the normal regurgitation was recovered and carried out in one subsequent return actuation.

- Shelf test \*\*: like the example 1, after neglect, while checking that a transparent liquid existed in a nozzle hole front face, the normal regurgitation was recovered and carried out in one subsequent return actuation.

[0062] (Example 3) The compounding ratio of recording ink is shown below.

[0063]

Water 68.2 % of the weight Polyoxyethylene nonylphenyl ether An ammonium sulfate 0.8 % of the weight Diethylene glycol 5.0 % of the weight Pyrrolidone 10.0 % of the weight Glycerol 5.0 % of the weight 3005.0 % of the weight (mean molecular weight) of polyethylene glycols Diethylene-glycol monobutyl ether 4.0 % of the weight Phthalocyanine system cyanogen pigment 2.0 % of the weight [0064] As a result of performing a phase separation trial after preparation and purification using the obtained recording ink, phase separation was clearly checked on the meniscus front face.

[0065] Next, the result of having prepared desiccation ink using the above-mentioned recording ink, and having performed the redispersible trial is shown.

- particle-size [ of desiccation ink ]: -- 177nm pigment particle-size [ of the recording ink before desiccation ]: -- expansion nature [ to the pure water of 95nm and desiccation ink ]: -- it was good like the example 1.

- Time of concentration from a to b at the tip of desiccation ink : 9.1 seconds [0066] Next, the result of various shelf tests is shown.

- Shelf test \*\*: 1 hour after the no-cap was found by carrying out the normal regurgitation from an initial dot.

- Shelf test \*\*: like the example 1, after neglect, while checking that a transparent liquid existed in a nozzle hole front face, the normal regurgitation was recovered and carried out in one subsequent return actuation.

- Shelf test \*\*: like the example 1, after neglect, while checking that a transparent liquid existed in a nozzle hole front face, the normal regurgitation was recovered and carried out in one subsequent return actuation.

- Shelf test \*\*: like the example 1, after neglect, while checking that a transparent liquid existed in a nozzle hole front face, the normal regurgitation was recovered and carried out in one subsequent return actuation.

[0067] (Example 1 of a comparison) The compounding ratio of recording ink is shown below. In addition, the inside of the parenthesis of a copolymer expresses the polymerization ratio of each monomer.

[0068]

Water 76.0 % of the weight Styrene-acrylic-acid-dodecylacrylate copolymer 1.5 % of the weight ; (65/20/15) Molecular weight 10,000 [ about ] Glycerol 7.0 % of the weight Polyethylene glycol 200 (average molecular weight)

8.0 % of the weight Tripropylene glycol 10.0 % of the weight Triethanolamine 0.5 % of the weight Carbon black 5.0 % of the weight [0069] As a result of performing a phase separation trial after preparation and purification using the obtained recording ink, phase separation was clearly checked on the meniscus front face.

[0070] Next, the result of having prepared desiccation ink using the above-mentioned recording ink, and having performed the redispersible trial is shown.

- particle-size [ of desiccation ink ]: -- 237nm pigment particle-size [ of the recording ink before desiccation ]: -- expansion nature [ to the pure water of 106nm and desiccation ink ]: -- it did not develop smoothly in pure water, but condensation collapse arose, and desiccation ink sank in the container base.

- Time of concentration from a to b at the tip of desiccation ink : measurement impossible [0071] - Shelf test \*\*: 1 hour after [ a part of ] a no-cap has a non-regurgitation nozzle, and the fall of impact precision is seen also for a regurgitation nozzle.

- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it checked that the liquid more transparent than the transparent liquid adhered at the tip of a wire on a nozzle hole front face existed. Then, although the printer was equipped with the head and return actuation by suction-wiping was performed, it did not return in one return actuation, but although it recovered in part in five return actuation, the non-regurgitation nozzle remained.

- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it checked that the liquid more transparent than the transparent liquid adhered at the tip of a wire on a nozzle hole front face existed. Then, although the printer was equipped with the head and return actuation by suction-wiping was performed, five return actuation is also unrecoverable.

Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it checked that the liquid more transparent than the transparent liquid adhered at the tip of a wire on a nozzle hole front face existed. Then, although the printer was equipped with the head and return actuation by suction-wiping was performed, five return actuation is also unrecoverable.

[0072] (Example 2 of a comparison) The compounding ratio of recording ink is shown below.

[0073]

Water 68.2 % of the weight Polyoxyethylene nonylphenyl ether An ammonium sulfate 0.8 % of the weight Glycerol 10.0 % of the weight Polyethylene glycol 300 (average molecular weight) 15.0 % of the weight Diethylene-glycol monobutyl ether 4.0 % of the weight Phthalocyanine system cyanogen pigment 2.0 % of the weight [0074] Phase separation was not checked as a result of performing a phase separation trial after preparation and purification using the obtained recording ink.

[0075] Next, the result of having prepared desiccation ink using the above-mentioned recording ink, and having performed the redispersible trial is shown.

- particle-size [ of desiccation ink ]: -- 207nm pigment particle-size [ of the recording ink before desiccation ]: -- expansion nature [ to the pure water of 109nm and desiccation ink ]: -- as shown in drawing 3, desiccation ink was smoothly developed in pure water.

- Time of concentration from a to b at the tip of desiccation ink : 18 seconds [0076] Next, the result of various shelf tests is shown.

- Shelf test \*\*: although there is no 1 hour after [ a no-cap ] non-regurgitation nozzle, the fall of impact precision is seen.

- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it turned out that phase separation has not arisen on a nozzle hole front face from black thickening recording ink having adhered at the tip of a wire. Then, in one return actuation, when the printer was equipped with the head and return actuation by suction-wiping was performed, although it could not return but all the nozzle regurgitation of all the nozzles was completely carried out in five return actuation, the fall of impact precision remained.

- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it turned out that phase separation has not arisen on a nozzle hole front face from black thickening recording ink having adhered at the tip of a wire. Then, in one return actuation, when the printer was equipped with the head and return actuation by suction-wiping was performed, although it could not return but all the nozzle regurgitation of all the nozzles was completely carried out in five return actuation, the fall of impact precision remained.

- Shelf test \*\*: when the fiber-like wire was contacted to the nozzle hole of the nozzle plate after neglect, it turned out that phase separation has not arisen on a nozzle hole front face from black thickening recording ink having adhered at the tip of a wire. Then, in one return actuation, when the printer was equipped with the head and return actuation by suction-wiping was performed, although it could not return but all the nozzle regurgitation of all the nozzles was

completely carried out in five return actuation, the fall of impact precision remained.

[0077]

[Effect of the Invention] As stated above, it turns out that it is recording ink which phase separation produces the dispersant of this invention range selected by the redispersible trial of this invention, and the recording ink of a moisturizer presentation in a list, and is excellent in the regurgitation recoverability in an emergency at blinding-proof nature and a list.

[0078] Furthermore, by using the evaluation approach of the watercolor pigment system recording ink of this invention, compared with aquosity color system recording ink, it excels in a deck watertight luminaire and lightfastness simple, and selection of the watercolor pigment system recording ink which is equal to real use is attained.

.....  
[Translation done.]

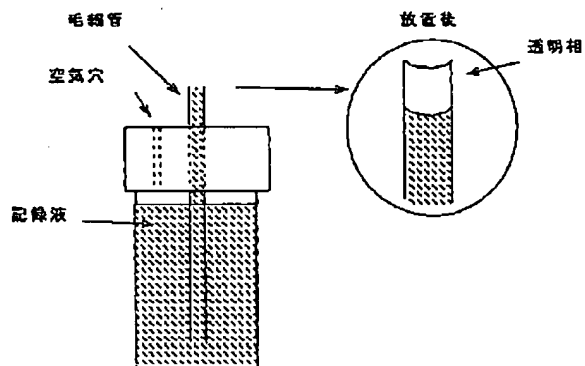
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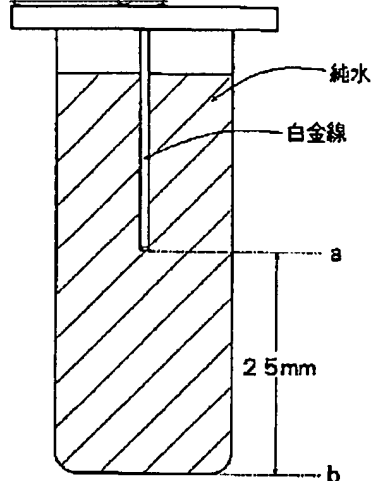
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]